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Supreme Court of the United States
OCTOBER TERM, 1997

KUMHO TIRE COMPANY, LTD., KUMHO U.S.A., INC., AND HERCULES TIRE & RUBBER COMPANY, INC.,
Petitioners,

v.

PATRICK CARMICHAEL, AN INDIVIDUAL AND FATHER AND NEXT OF KIN TO PATRICK CARMICHAEL, JR., A MINOR, LUZVIMINDA CARMICHAEL, AN INDIVIDUAL, MOTHER AND NEXT FRIEND OF CARINA HORN, A MINOR, AND ADMINISTRATRIX OF THE ESTATE OF JANICE HORN, CARINA HORN, A MINOR, LEONA CARMICHAEL, SHAMEELA CARMICHAEL, NATIMAH CARMICHAEL,
Respondents.

On Writ of Certiorari to the United States Court of Appeals for the Eleventh Circuit

BRIEF OF THE AMERICAN TORT REFORM ASSOCIATION, AMERICAN CONSULTING ENGINEERS COUNCIL, AND NATIONAL ASSOCIATION OF MANUFACTURERS AS *AMICI CURIAE* IN SUPPORT OF PETITIONERS

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QUESTION PRESENTED

May a trial judge consider the four factors set out by this Court in *Daubert v. Merrill Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), in a Rule 702 analysis of the admissibility of an engineering expert's testimony.

TABLE OF CONTENTS

	Page
QUESTION PRESENTED	i
TABLE OF AUTHORITIES	v
STATEMENT OF INTEREST	1
INTRODUCTION AND SUMMARY OF THE ARGUMENT	3
ARGUMENT	6
I. THE LANGUAGE AND POLICY OF RULE 702 REQUIRE THAT A *DAUBERT*-TYPE ANALYSIS APPLY TO TECHNICAL TESTIMONY	6
A. Evidentiary Reliability Of Technical Testimony Can Only Be Assured If Courts Exercise Their Traditional Gatekeeper Responsibilities	6
1. Experts Are Afforded Testimonial Latitude Well Beyond That Afforded Lay Witnesses	7
a. Experts Are Free To Render Opinions Not Based On Firsthand Knowledge	7
b. Experts Can Testify About Otherwise Inadmissible Hearsay	8
c. Experts Can Respond To Hypothetical Questions	9
d. Experts Can Testify About Ultimate Issues	10
2. Traditional Safeguards, Such As Cross-Examination, Are Not A Meaningful Substitute For Judicial Scrutiny	10

TABLE OF CONTENTS—Continued

	Page
B. Rule 702 Must Be Read In Light Of Its Plain Meaning	13
1. "Knowledge" As A Noun	13
2. "Science" As An Adjective	14
3. "Engineering" As An Adjective	15
II. MYTHICAL DISTINCTIONS EMBRACED BY SOME CIRCUITS INTERFERE WITH REASONED DECISIONMAKING AND UNDERMINE RATIONAL DISPUTE RESOLUTION	18
A. The Myth Of Science Versus Experience	18
B. The Myth Of Science Versus Nonscience	20
III. TESTIMONY OF EXPERTS MUST BE EVALUATED WITHIN THE ANALYTICAL FRAMEWORK OF THE EXPERT'S DISCIPLINE	21
A. An Analytical Framework Is Necessary For Knowledge To Exist	21
B. Evaluation Of Expert Opinion By A Court Is Not Intrusive, Since It Is Designed To Ensure That The Factfinder Is "Assisted" By The Expert	24
CONCLUSION	25

TABLE OF AUTHORITIES

CASES	Page
Adams v. Indiana Bell Telephone Company, Inc., 1998 U.S. Dist. LEXIS 5676 (S.D. Ind. Jan. 23, 1998)	12
Belofsky v. General Electric Co., 980 F. Supp. 818 (D.V.I. 1997), *recons. denied*, 1998 U.S. Dist. LEXIS 4426 (D.V.I. Mar. 30, 1998)	14
Berry v. City of Detroit, 25 F.3d 1342 (6th Cir. 1994)	19
Blue Chip Stamps v. Manor Drug Stores, 421 U.S. 723 (1975)	13
Bunt v. Altec Industries, Inc., 962 F. Supp. 313 (N.D.N.Y. 1997)	18
Carmichael v. Samyang Tire, Inc., 131 F.3d 1433 (11th Cir.), *cert. granted sub nom. Kumho Tire Co., Ltd. v. Carmichael*, 118 S. Ct. 2339 (1998)	*passim*
Central Bank of Denver, N.A. v. First Interstate Bank of Denver, N.A., 511 U.S. 164 (1994)	13
Compton v. Subaru of America, Inc., 82 F.3d 1513 (10th Cir.), *cert. denied*, 117 S. Ct. 611 (1996), *rehearing denied*, 117 S. Ct. 1022 (1997)	18
Daubert v. Merrill Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993)	*passim*
Deere v. Goodyear Tire & Rubber Co., 175 F.R.D. 157 (N.D.N.Y. 1997)	17
Doblar v. Unverferth Manufacturing Co., Inc., 981 F. Supp. 1284 (D.S.D. 1997)	17
Dysart Peerage Case, 6 App. Cas. 489 (1881) (H.L.)	8
Folkes v. Chadd, 99 Eng. Rep. 589 (1782)	6
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TABLE OF AUTHORITIES—Continued

	Page
Jaurequi v. John Deere Co., 971 F. Supp. 416 (E.D. Mo. 1997)	17
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McCormick v. Talcott, 61 U.S. 402 (1857)	7
McKendall v. Crown Control Corp., 122 F.3d 803 (9th Cir. 1997)	20
N.L.R.B. v. International Longshoremen's Ass'n, 447 U.S. 490 (1980)	19
Rogers v. Ingersoll-Rand Co., 971 F. Supp. 4 (D.D.C. 1997), *aff'd*, 1998 WL 271090 (D.C. Cir. May 29, 1998)	17
Specht v. Jensen, 853 F.2d 805 (10th Cir. 1988)	12
Trumps v. Toastmaster, Inc., 969 F. Supp. 247 (S.D.N.Y. 1997)	17
United States v. Addison, 498 F.2d 741 (D.C. Cir. 1974)	11
United States v. Blarek II, 1998 WL 264792 (E.D.N.Y. May 21, 1998)	4
United States v. Kime, 99 F.3d 870 (8th Cir. 1996), *cert. denied*, 117 S. Ct. 1015 (1997)	12
Watkins v. Telsmith, Inc., 121 F.3d 984 (5th Cir. 1997)	17
STATUTES	
42 U.S.C. § 1862(a)(4)	15
FEDERAL RULES OF EVIDENCE	
Federal Rule of Evidence 701	8
Federal Rule of Evidence 702	*passim*
Federal Rule of Evidence 703	8, 9
Federal Rule of Evidence 704	10
Federal Rule of Evidence 705	9
Federal Rule of Evidence 803(18)	8

TABLE OF AUTHORITIES—Continued

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TABLE OF AUTHORITIES—Continued

	Page
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STATEMENT OF INTEREST[1]

Amici, the American Tort Reform Association ("ATRA"), American Consulting Engineers Council

[1] Counsel for Petitioners and Respondents have filed a letter with the Court Clerk indicating the parties' blanket consent to the filing of *amicus* briefs in this case, including this brief. In accordance

("ACEC"), and National Association of Manufacturers ("NAM"), submit this brief principally to emphasize that the reliability gateways of Rule 702 of the Federal Rules of Evidence, as articulated by this Court in *Daubert v. Merrill Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), should apply with equal vigor to both scientific and technical knowledge. All expert opinion must be evaluated using guidelines appropriate to the discipline involved. To hold otherwise would ignore the way in which science and technology interrelate, lead to absurd results, and erode confidence in the civil justice system.

ATRA, founded in 1986, is a broad-based, bipartisan coalition of more than 300 businesses, corporations, municipalities, associations, and professional firms who have pooled their resources to promote reform of the civil justice system with the goal of ensuring fairness, balance and predictability in civil litigation. For over a decade, ATRA has filed *amicus curiae* briefs in cases before the United States Supreme Court and state courts of last resort that have addressed important liability issues.

ACEC is the largest national organization of engineers in the independent practice of consulting engineering. ACEC has 5,800 member firms employing more than 250,000 professional engineers, land surveyors, architects, scientists, and technicians involved in many different engineering disciplines who design over $100 billion in construction projects annually. More than seventy-five percent of these firms are small businesses with fewer than twenty-five employees each.

NAM is a non-profit voluntary business association representing more than 14,000 companies and subsidiaries that together employ more than eighty-five percent of all manufacturing workers in the United States and produce

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with Supreme Court Rule 37.6, *amici* state that no counsel for either party has authored this brief in whole or in part, and no persons or entities, other than the *amici curiae*, have made a monetary contribution to the preparation or submission of this brief.

more than eighty percent of the nation's manufactured goods. More than 128,000 additional businesses are affiliated with NAM through the NAM Associations Council and the National Industrial Council.

INTRODUCTION AND SUMMARY OF ARGUMENT

The issue in this case is whether "gatekeeper" judicial review should apply to the admissibility of expert testimony about "technical and other specialized knowledge," such as engineering, to ensure that the testimony meets certain minimum guidelines of evidentiary reliability. *Amici* submit that all expert opinion must be so evaluated using guidelines appropriate to the discipline involved. An engineering opinion developed without regard to the "engineering method" is no more reliable, no more likely to assist the trier of fact, and no more admissible than a scientific opinion developed without regard to the "scientific method." Every discipline, whether engineering, accounting or law, operates within an analytical framework which embodies fundamental concepts designed to ensure the reliability of that endeavor. Courts should, and *amici* submit are required to, gauge the process that the expert used to formulate his or her opinion against the standards of the expert's own discipline.

Courts that have declined to apply the teachings of *Daubert v. Merrill Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993), to what they deem "nonscientific" opinions subscribe to one or more of four myths.

First is the myth that the universe is neatly divided between the "scientific" and the "nonscientific," and that different rules should apply to each. Such a dichotomy does not exist. Technical disciplines, such as engineering, that some courts have characterized as "nonscientific," depend on scientific principles and apply a method remarkably similar to the familiar scientific method.

Second is the myth that the world is divided between "science" and "experience." Once again, those who hold

this belief argue that different rules should apply to each. Immanuel Kant discredited the existence of a bright line of demarcation between science and experience more than 200 years ago.[2]

The third myth is that nonscientific testimony, whether technical or otherwise, need not be subject to the same indicia of reliability as testimony that has been classified as "scientific." The very dangers that led to the adoption of Rule 702 of the Federal Rules of Evidence and this Court to issue *Daubert* are present, whether the testimony is scientific or technical: the same risks concerning unreliable opinions developed without regard to any known analytical framework exist whether the witness is a scientist or engineer.

Finally, there is the myth that the *Daubert* reliability gateways unreasonably invade the province of the jury and trespass on the right to trial by jury contained in the Seventh Amendment to the United States Constitution. Underlying this myth is the argument that expert screening can be appropriately handled by cross-examination, making the gatekeeper function of the judge superfluous. To the contrary, the very type of expert testimony proffered in this case shows the need for the gatekeeper function with respect to the testimony of engineering experts. The expert witness is not on the stand to testify simply to facts that he or she observed; the very reason for admitting expert testimony is that the subject matter is outside the ken of the average juror.

According to the views of those who champion an artificially narrow reading of Rule 702 and *Daubert*, the chemist who synthesizes a small quantity of a compound in a laboratory beaker for research purposes is practicing

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[2] Kant has been characterized as "one of the most important philosophers in Western Culture." *United States v. Blarek II*, 1998 WL 264792, at *5 (E.D.N.Y. May 21, 1998) (Judge Weinstein quoting from Diane Collinson, *Fifty Major Philosophers: A Reference Guide* 89 (1992)).

science, while the chemical engineer who produces large quantities of that very same compound in a factory for commercial distribution is practicing engineering. Thus, the opinion of the chemist would be subject to the reliability gateways of *Daubert*, while that of the chemical engineer would not. Paradoxically, the expert testifying about the more complex process, the one where the chemical is produced in large quantities, would be subject to less judicial scrutiny than the individual testifying about the simpler laboratory process.

Amici believe that a rational system of dispute resolution must necessarily mirror reality and, in the context of a product liability case, must avoid adopting evidentiary rules that rely on baseless distinctions which clash with the principles and methods used to design, test, and manufacture products.

In this brief, *amici* first demonstrate that there is no legal basis for treating engineering and technical testimony any differently than scientific testimony. The wording of Rule 702 draws no distinction between the two and reason suggests that there should be none. Moreover, historically, engineers, when testifying as experts, have been afforded the same wide testimonial latitude as scientists. Therefore, they should pass through the same "gateways" of judicial review to ensure their testimony is reliable. Second, *amici* show that the distinctions that some courts have used to justify not applying *Daubert*—science versus experience, and science versus nonscience—do not exist. These distinctions are little more than mirages that disappear upon close scrutiny and that otherwise interfere with reasoned decisionmaking. Finally, *amici* suggest that the *Daubert* framework, incorporating guidelines suitable to the discipline involved, should, as matter of both sound legal reasoning and prudent public policy, apply to all expert testimony.

ARGUMENT

I. THE LANGUAGE AND POLICY OF RULE 702 REQUIRE THAT A *DAUBERT*-TYPE ANALYSIS APPLY TO TECHNICAL TESTIMONY

Respondents, and those who seek to limit Rule 702 and ignore its words, apparently believe that courts lack the authority to gauge the reliability of "nonscientific" opinions, although the same courts have both the authority and the duty to do so with respect to "scientific" opinions. The view that the judiciary must indulge expert testimony so long as it is classified as "nonscience" defies common sense. This is why.

First, the baseless distinction between "scientific" and "nonscientific" opinions ignores the wide latitude historically afforded all experts, especially engineers, and the dangers inherent in unbridled testimony.[3] Second, it ignores the role that courts have traditionally played in acting as gatekeepers to ensure the reliability of all expert testimony. Third, it ignores the plain language of Rule 702, which draws no distinction between opinions based on "scientific knowledge" and opinions based on "technical knowledge." *See General Electric Co. v. Joiner*, 118 S. Ct. 512, 520-21 (1997) (Breyer, J., concurring) (noting that science and technology are becoming increasingly important in litigation and pose the same issues).

A. Evidentiary Reliability of Technical Testimony Can Only Be Assured If Courts Exercise Their Traditional Gatekeeper Responsibilities

Expert testimony is simultaneously ubiquitous and unique. On the one hand, in product liability litigation,

[3] Interestingly, the first modern case legitimizing the unique role of the paid expert in civil litigation involved the testimony of engineers. *See Folkes v. Chadd*, 99 Eng. Rep. 589, 590 (1782) (illustrating use of engineers as witnesses to address causes for harbor's decay).

experts may be more prevalent than lay witnesses. On the other hand, they do not labor under the same constraints that limit lay witness testimony. By way of example, expert witnesses are permitted to: (1) render opinions not based on their firsthand knowledge; (2) give factual testimony that is based on inadmissible hearsay; (3) respond to hypothetical questions based on assumptions that are either unspoken or never proven; and (4) testify about the ultimate question of fact before the jury. The normal rules of exclusion that help ensure the reliability of lay witness testimony do not apply to experts who may be as "skillful and effective in producing obscurity and error, as in the elucidation of truth." *McCormick v. Talcott*, 61 U.S. 402, 409 (1857) (Daniel, J., dissenting). *See also* Joseph S. Bell, *The Use And Abuse of Expert Testimony* 7-8 (1879).

Traditional safeguards to help the factfinder discover the truth, such as vigorous cross-examination or extensive discovery, appreciate that the factfinder is basing his or her judgment on experiences from everyday life. Expert testimony, however, is permitted and encouraged precisely because such testimony is outside the range of normal experience. It is, therefore, unrealistic to rely solely on the engine of cross-examination to help the factfinder. The wide latitude afforded experts only makes the search for the truth more difficult.

1. *Experts Are Afforded Testimonial Latitude Well Beyond That Afforded Lay Witnesses*

a. *Experts Are Free To Render Opinions Not Based on Their Firsthand Knowledge*

The rule that experts are free to render opinions not based on their firsthand knowledge has long distinguished expert from lay testimony. One of the earliest rules of exclusion at common law held that witnesses could only testify as to matters within their personal knowledge. Lay witnesses were, therefore, precluded from presenting

opinions.[4] From early days, however, a special exception was created for expert witnesses who were not only permitted to render opinions, but in fact were expected to do so.[5]

This principle finds full expression in Rule 702, which permits an expert to "testify . . . in the form of an opinion or otherwise," and in Rule 703, which permits experts to testify based on information that is simply "made known" to the expert "at or before the hearing." By contrast, lay witnesses are afforded no such wide latitude. *See* Fed. R. Evid. 701.

b. ***Experts Can Testify About Otherwise Inadmissible Hearsay***

The one rule of evidence most frequently associated with the Anglo-American system is the ban on most forms of hearsay testimony. "[H]earsay evidence, that is to say, the evidence of a man who is not produced in court and who therefore cannot be cross-examined, as a general rule is not at all admissible." *Dysart Peerage Case*, 6 App. Cas. 489, 503 (1881) (H.L.). *See also* Sir Geoffrey Gilbert, *Law Of Evidence* 152 (1760).

The modern rule, which excludes most forms of hearsay, is based on the notion that hearsay testimony is inherently untrustworthy, because it is not amenable to cross-examination. In many respects, however, this basic rule does *not* apply to the testimony of an expert. *See* Fed. R. Evid. 703; Fed. R. Evid. 803(18). This is a key

[4] *See* William S. Holdsworth, 9 *A History Of English Law* 211 n.4 (1926); Thomas Starkie, *Evidence* 173 (1824) (witness may not be examined about his "belief or persuasion").

[5] As early as the fourteenth century, English courts enlisted the assistance of experts in resolving "technical" matters. In 1353, for example, surgeons were summoned by the court to give their opinion on the question of whether a wound amounted to a mayhem. *See* William S. Holdsworth, 9 *A History Of English Law* 212 (1926). These experts were appointed and paid by the court.

reason why the judicial gatekeeper function is an essential screening device for expert testimony.

c. ***Experts Can Respond To Hypothetical Questions***

At common law and under the Federal Rules of Evidence, experts are permitted to respond to hypothetical questions. *See* 2 John H. Wigmore, *Evidence In Trials At Common Law* § 679 (Chadbourn rev. 1978). The hypothetical question was originally introduced as a way of permitting an expert to testify without allowing the expert to speak to an ultimate issue of fact. *See* Tal Golan, *Scientific Expert Testimony in Anglo-American Courts, 1782-1923*, Chap. 3, at 107 (1997) (unpublished Ph.D. dissertation, Massachusetts Institute of Technology) (providing an excellent historical treatment of technology-based expert opinion in American and English courts). As Golan notes, however, use of the hypothetical question quickly degenerated and, in the hands of artful trial attorneys, became "that feature which does most to disgust men of science with the law of evidence." John H. Wigmore, *A Treatise on a System of Evidence in Trials at Common Law*, § 686 (3d ed. 1940). In response to these concerns, use of the hypothetical question was restricted. *See* Charles T. McCormick, *McCormick On Evidence* § 14, at 37-38 (Edward W. Cleary, *et al.*, eds., 3d ed. 1984); 32 C.J.S. *Evidence* § 552 (1964). The Federal Rules, however, liberalized these restrictions. The combination of Rules 702, 703, and 705 enables counsel to ask hypothetical questions that incorporate facts or data not in evidence, and which need not be disclosed during examination. *See* Fed. R. Evid. 702; Fed. R. Evid. 703; Fed. R. Evid. 705. They can be given to the expert in the secrecy of the office of the attorney who will present that expert. This is another reason why the judicial gatekeeper function is essential for expert testimony.

d. *Experts Can Testify About Ultimate Issues*

Both the power and potential danger of expert testimony lie in large part in the expert's authority to draw conclusions concerning the ultimate issues to be decided by the jury. The fact that such testimony arguably invades the province of the jury once led many states to exclude such expert opinions in their state court systems. *See McCormick On Evidence, supra*, § 12, at 30. By contrast, the Federal Rules of Evidence expressly permit an expert to give testimony on an ultimate issue of fact, except in criminal actions where a defendant's mental state is at issue. *See* Fed. R. Evid. 704. This is yet another reason why the judicial gatekeeper function is essential for expert testimony.

2. ***Traditional Safeguards, Such As Cross-examination, Are Not A Meaningful Substitute For Judicial Scrutiny***

Few would deny that, in most situations, cross-examination is an effective filter to help jurors find out who is telling the truth. Effective cross-examination, however, presupposes that the factfinder has the background and experience to appreciate weaknesses made evident during the cross.[6] When it comes to expert testimony, however, only the experts themselves have the background and experience needed to make a full evaluation.

This has long been recognized as a stumbling block in the search for the truth at trial.[7] Judge Learned Hand highlighted the problem:

[6] Effective cross-examination also presupposes that the attorneys will have ample opportunity to prepare through discovery for the cross. This, however, may not always be the case. *See* Paul F. Rothstein, *The Collision Between New Discovery Amendments and Expert Testimony Rules*, 14 Litig. 17 (1988).

[7] *See generally* William L. Foster, *Expert Testimony—Prevalent Complaints and Proposed Remedies*, 11 Harv. L. Rev. 169 (1897) (discussing the problem of confusion among lay fact-finders caused by expert witnesses reaching opposite conclusions).

> The whole object of the expert is to tell the jury, not facts, as we have seen, but general truths derived from his specialized experience. But how can the jury judge between two statements each founded upon an experience confessedly foreign in kind to their own? It is just because they are incompetent for such a task that the expert is necessary at all.

Learned Hand, *Historical and Practical Considerations Regarding Expert Testimony*, 15 Harv. L. Rev. 40, 54 (1902).[8]

This concern is all the more warranted as more technology-based disputes make their way through the state and federal court systems. *See* Bert Black & Patrick Lee, *Expert Evidence: A Practitioner's Guide to Law, Science, and the FJC Manual* (1997); Federal Judicial Center, *Reference Manual On Scientific Evidence* 1-5 (1994). The burden on jurors can be especially acute where, as here, they would likely be asked to resolve technical issues involving the interplay of physics, chemistry, and mechanics, aspects of which are necessary to understand the forces that can affect the integrity of a tire.

Adding to the difficulty any lay person has in evaluating a cross-examination of an expert is the fact that technical opinions have an inherent aura about them which, if not properly checked by the judge, can "assume a posture of mystic infallibility in the eyes of a jury of laymen," *United States v. Addison*, 498 F.2d 741, 744 (D.C. Cir. 1974). *See also* Note, *A Question of Competence*, 104 Harv. L. Rev. 773, 780 (1990). Indeed, those courts that have applied *Daubert* to engineering and other technical disciplines have stressed the powerful and potentially misleading character of such evidence and the way in

[8] *See* T. D. Crothers, *The Psychology of a Jury in a Long Trial*, 73 Scientific Am. 104 (Aug. 17, 1896) (complaining that it is unreasonable to expect jurors to resolve complex testimony that requires "training in the most favorable surroundings").

which it may sway a jury even when the basis of the testimony is palpably wrong.[9]

In sum, it is unrealistic to presume that cross-examination alone, no matter how ably conducted, can ferret out unsound expert evidence. In such a setting, "trial judges have a heightened responsibility to ensure that expert testimony show some indicia of reliability." *Specht v. Jensen*, 853 F.2d 805, 808 (10th Cir. 1988). This is especially so in cases involving nonscientific testimony where the trustworthiness of . . . [the] expert testimony is every bit as suspect as the reliability of scientific evidence." Edward J. Imwinkelried, *The Next Step After Daubert: Developing A Similarly Epistemological Approach to Ensuring The Reliability of Nonscientific Expert Testimony*, 15 Cardozo L. Rev. 2271, 2279 (1994). *See* Jonathan M. Hoffman, *'Daubert's' Application to Testimony From Non-Scientific Experts*, Prod. Safety & Liab. Rptr., July 31, 1998, at 740-43. The gatekeeper function and principles set forth in *Daubert* meet that responsibility, irrespective of the discipline involved, by filtering out evidence "tainted by farce or fiction."

[9] *See Specht v. Jensen*, 853 F.2d 805, 808 (10th Cir. 1988) (noting that the false mystique and "aura of trustworthiness and reliability" exist even where the expert is an attorney); *United States v. Kime*, 99 F.3d 870, 884-85 (8th Cir. 1996), *cert. denied*, 117 S. Ct. 1015 (1997) (affirming exclusion of expert testimony because of risk of misleading jury); *Adams v. Indiana Bell Tel. Co., Inc.*, 1998 U.S. Dist. LEXIS 5676 (S.D. Ind. Jan. 23, 1998) (stating the view that experts can mislead and confuse a jury). *See also* Stephen E. Fienberg, Samuel H. Krislov & Miron L. Straf, *Understanding and Evaluating Statistical Evidence in Litigation*, 36 Jurimetrics 1-32 (1995) (factfinders can be misled by statisticians); E. Donald Elliott, *Issues in Civil Procedure: Advancing the Dialogue*, 69 B.U.L. Rev. 487, 493 (1989) (factfinders can be misled by experts); Robert Charrow & Veda Charrow, *Making Legal Language Understandable: A Psycholinguistic Study of Jury Instructions*, 70 Colum. L. Rev. 1305 (1979) (relying on jury instructions to help the jurors filter technical testimony may not be realistic since jurors have great difficulty understanding even simple jury instructions).

Guillory v. Doimtar Industries Inc., 95 F.3d 1320, 1331 (5th Cir. 1996).

B. Rule 702 Must Be Read In Light Of Its Plain Meaning

This Court has consistently noted that "'[t]he starting point in every case involving construction of a statute is the language itself.'" *Landreth Timber Co. v. Landreth*, 471 U.S. 681, 685 (1985) (*quoting Blue Chip Stamps v. Manor Drug Stores*, 421 U.S. 723, 756 (1975) (Powell, J., concurring)). *See also Central Bank of Denver, N.A. v. First Interstate Bank of Denver, N.A.*, 511 U.S. 164, 170-76 (1994). Here, the plain meaning of Rule 702 comports with the policy underlying the Rule, namely that it is the trial court's responsibility to ensure that a proffered expert opinion is reliable and relevant.

1. *"Knowledge" As A Noun*

On its face, Rule 702 makes no distinction between the words "scientific" and "technical": both are adjectives modifying the noun "knowledge." *See Daubert*, 509 U.S. at 590. Rule 702 is, therefore, built around this single, but powerful word, "knowledge." As such, the rule requires that the expert opinion involve some sort of knowledge, be it scientific, technical, or otherwise, and that the expert's knowledge must be more than "speculation" or "subjective belief"—it must be acquired through or "based on a reliable methodology." *Hanks v. Korea Iron & Steel Co.*, 993 F. Supp. 1204, 1207 (S.D. Ill. 1998).[10] As such,

[10] *See also In re Paoli Railroad Yard PCB Litig.*, 35 F.3d 717, 742 (3d Cir. 1994) (citing *Daubert* for the proposition that an expert's opinion must be based on the "methods and procedures of science" rather than on "subjective belief or unsupported speculation") (subsequent history omitted); *Lithuanian Commerce Corp., Ltd. v. Sara Lee Hosiery*, 177 F.R.D. 245, 255 (D.N.J. 1997) ("The term 'knowledge,' which is 'more than subjective belief or unsupported speculation,' is 'any body of known facts or to any body of ideas inferred

> knowledge connotes more than subjective belief or unsupported speculation. The term "applies to any body of known facts or to any body of ideas inferred from such facts or accepted as truths on good grounds."

Daubert, 509 U.S. at 590 (quoting from *Webster's Third International Dictionary* 1252 (1986)).

2. *"Science" As An Adjective*

The starting point for a Rule 702 analysis is determining whether the expert opinion is based on information acquired through an analytical process. Analytical processes, though, come in many sizes and shapes. The applicable adjective (*i.e.*, "scientific" or "technical") in the Rule defines the nature of that analytical process, thereby permitting a court to evaluate the process and the opinion against established benchmarks.

In *Daubert*, for example, the proffered testimony ostensibly involved issues of science; thus, the Court held that the analytical process used to acquire the information must involve the scientific method: "to qualify as 'scientific knowledge,' an inference or assertion must be derived by the scientific method." *Daubert*, 509 U.S. at 590. Inasmuch as the scientific method varies somewhat from discipline to discipline,[11] the "inquiry envisioned by Rule

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from such facts or accepted as truths on good grounds') (internal citations omitted); *Belofsky v. General Elec. Co.*, 980 F. Supp. 818, 822 (D.V.I. 1997) ("*Daubert* teaches that a judge should find an expert opinion reliable under Rule 702 if it is based on 'good grounds,' i.e., if it is based on reliable and replicable methods and procedures"), *recons. denied*, 1998 U.S. Dist. LEXIS 4426 (D.V.I. Mar. 30, 1998).

[11] *See* Paul S. Milich, *Controversial Science in the Courtroom: Daubert and the Law's Hubris*, 43 Emory L.J. 913, 920 (1994); Philip Kitcher, *The Advancement of Science: Science without Legend, Objectivity without Illusions* 58-86 (1993).

702 is . . . a flexible one" designed to ensure reliability and helpfulness. *Daubert*, 509 U.S. at 594.

3. *"Engineering" As An Adjective*

Like scientific knowledge, engineering knowledge is a body of information and thought developed using the analytical methods of the engineering profession. Just as scientific knowledge is acquired through the scientific method, engineering knowledge is acquired through the "engineering method." The engineering method is closely linked to the scientific method. *See* 42 U.S.C. § 1862 (a)(4) (instructing National Science Foundation to "foster and support the development and use of computer and other scientific and engineering methods and technologies, primarily for research and education in the sciences and engineering.") Indeed, engineering is commonly referred to as an "applied science," because it involves the application of scientific knowledge to resolve practical problems.

The traditional "engineering method" consists of various steps that closely parallel the "scientific method."[12] In engineering, one initially: (1) defines the problem, (2) accumulates facts, (3) makes necessary assumptions, and (4) selects an appropriate and established scientific, mathematical or engineering principle. These four activities are precisely what a scientist must do to formulate a hypothesis. *See* Willard Van Orman Quine, *Pursuit of Truth* 9-12 (Rev. ed. 1992). The engineer then: (5) solves the problem, (6) considers alternate solutions, and (7) verifies the results. These three steps are analogous to conducting an experiment to test the hypothesis, looking at alternate hypotheses, and replicating the experiment, respectively. *See* Francisco J. Ayala & Bert Black, *The Nature of Science and the Problem of Demarcation*, 1

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[12] *See* B. V. Koen, *Definition of the Engineering Method* 61 (1985) (arguing that from a philosophical perspective there is no single definition of engineering that satisfies all aspects of the field).

Science and Courts 1 (1993); Karl R. Popper, *The Logic of Scientific Discovery* 44-45, 53-54 (Rev. ed. 1972); Karl R. Popper, *Objective Knowledge* 181 (Rev. ed. 1979).

Even the publication requisite of the scientific method finds an analog in engineering. Engineers invariably rely on scientific or engineering principles which themselves have been published in peer-reviewed literature. In addition, many engineers "publish" their works in a unique way: the products that they design are tested not in the marketplace of ideas as is the case with scientists, but in the marketplace of commerce.

Like the "scientific method," the "engineering method" provides a reliable guide for the engineering community. The perils of practicing engineering without regard to the engineering method are evident in cases such as this one. Here, Respondents' mechanical engineer, Dennis Carlson ("Carlson"), concluded that the tire at issue failed, because of either a design or manufacturing defect. The problem with his opinion was that it lacked an analytical framework. Carlson made no attempt to "accumulate facts," as required by the engineering method. Instead, he prepared his report without comparing that tire to the three similar tires that had not failed, and without even interviewing the owner of the car. Moreover, Carlson made "no pretense of basing his opinion on any scientific theory of physics or chemistry." *Carmichael v. Samyang Tire, Inc.*, 131 F.3d 1433, 1436 (11th Cir.), *cert. granted sub nom. Kumho Tire Co., Ltd. v. Carmichael*, 118 S. Ct. 2339 (1998). The Court of Appeals said that his conclusions were "non-scientific." 131 F.3d at 1436 n.7.

Lacking accumulated facts and a supporting scientific principle, Carlson's opinion was little more than his own purely subjective belief. Carlson rendered an expert opinion about technical issues of tire construction and failure without regard to the engineering method. His opinion lacked the normal indicia of reliability—a key feature of Rule 702—and "could not be evaluated for [its] 'general

acceptance' or known rate of error. . . ." *Watkins v. Telsmith, Inc.*, 121 F.3d 984, 990 (5th Cir. 1997). In short, he acted as a lay witness, not as an expert witness, except that he testified with all the benefits that the law confers on experts.

Engineering is dependent on fundamental principles of science, and the engineering method is analogous to the scientific method. No "stretch" is required to apply the *Daubert* criteria to engineering decisions.[13] The *Daubert* guideposts are easily applied to engineering testimony, as evidenced by the District Court's opinion in this case, as well as trial court decisions in numerous other cases. *See, e.g., Doblar v. Unverferth Manufacturing Co., Inc.*, 981 F. Supp. 1284, 1286-87 (D.S.D. 1997) (applying *Daubert* to safety engineer and allowing engineer's testimony); *Deere v. Goodyear Tire & Rubber Co.*, 175 F.R.D. 157, 163-164 (N.D.N.Y. 1997) (applying *Daubert* to tire engineer and allowing testimony); *Trumps v. Toastmaster, Inc.*, 969 F. Supp. 247, 249-53 (S.D.N.Y. 1997) (applying *Daubert* to mechanical engineer and excluding testimony for lack of testable methodology); *Rogers v. Ingersoll-Rand Co.*, 971 F. Supp. 4, 15-16 (D.D.C. 1997) (applying *Daubert* to safety engineer and allowing testimony), *aff'd*, 1998 WL 271090 (D.C. Cir. May 29, 1998); *Jaurequi v. John Deere Co.*, 971 F. Supp. 416, 425-27 (E.D. Mo. 1997) (applying *Daubert* to mechanical engineer and excluding testimony for lack of

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[13] The observation that engineering involves the intersection of many scientific disciplines is not new. One writer, frustrated with the extent of mining litigation at the turn of the century, noted that in order to be a real mining engineer one had to have "a thorough knowledge of chemistry, assaying, geology, mathematics, surveying, and connaisance of several languages and law." *Who is a Mining Engineer?* 57 Mining Rptr. 129 (Feb. 7, 1907). *See* Clark C. Spence, *Mining Engineers and the American West* 202-203 (1993) (discussing the mining litigation boom of the 1890s and the widespread use of mining engineers as experts including those with such colorful names as Samuel "Cyanide Sam" Christie, a professor at the University of California at Berkeley).

reliability); *Bunt v. Altec Industries, Inc.*, 962 F. Supp. 313, 316-18 (N.D.N.Y. 1997) (applying *Daubert* to mechanical engineer and allowing engineer's testimony because opinion grounded in "scientific reasoning based upon years of experience and training").

Amici submit that the *Daubert*-type analysis must be applied to engineering and other technical opinions for two reasons. First, as noted above, it is required by Rule 702. Second, it is virtually impossible to attempt to differentiate between science and experience, and between science and nonscience.

II. MYTHICAL DISTINCTIONS EMBRACED BY SOME CIRCUITS INTERFERE WITH REASONED DECISIONMAKING AND UNDERMINE RATIONAL DISPUTE RESOLUTION

Some courts and commentators have declined to apply the plain language of Rule 702 or the reasoning of this Court in *Daubert* to technical or so-called nonscientific opinions. Those who have rejected a plain meaning reading of Rule 702 to encompass this form of testimony have done so by attempting to create arbitrary distinctions that do not exist. *Amici* submit that an artificial classification not based on the Rule's text serves to divert a trial court's attention from its duty to evaluate the reliability and helpfulness of an expert opinion.

A. The Myth Of Science Versus Experience

In the case below, the Court of Appeals, following the lead of the Tenth Circuit in *Compton v. Subaru of America, Inc.*, 82 F.3d 1513 (10th Cir.), *cert. denied*, 117 S. Ct. 611 (1996), *rehearing denied*, 117 S. Ct. 1022 (1997), concluded that *Daubert* did not apply where an expert witness, such as Respondents' mechanical engineer, relies on experience rather than science. *See Carmichael*, 131 F.3d at 1436. The notion that one can distinguish between science and experience when it comes to expert testimony is flawed. Expert opinion, by definition, does

not qualify as "knowledge," where no analytical method has been used. Therefore, the opinion is not admissible under Rule 702. In short, a *Compton*-type analysis is "an exercise in *reductio ad absurdum*." *N.L.R.B. v. International Longshoremen's Ass'n.*, 447 U.S. 490, 527 n.3 (1980) (Burger, C.J., dissenting).

The Court of Appeals in this case fell prey to the fallacy that one can distinguish between experience and science. Under the Eleventh Circuit's view, Carlson, the Respondents' expert engineer, would be free to testify provided his engineering opinions are not based on any scientific principles. Since the engineering method is built on science, the Circuit Court's opinion essentially ignored the knowledge requirement of Rule 702.

The Eleventh Circuit's opinion in the instant case also illustrates the difficulty that some courts have had in differentiating between expert testimony and the testimony of fact witnesses. For example, in an effort to further develop the *Compton* notion that experience and knowledge can somehow be separately analyzed, the Circuit Court recounted a hypothetical using the beekeeper illustration of Sixth Circuit fame. *See Berry v. City of Detroit*, 25 F.3d 1342, 1349-50 (6th Cir. 1994).

In the hypothetical, a beekeeper observes that his bees always take off into the wind. If one wanted to prove that, in general, bumblebees always take off into the wind, the beekeeper could testify, according to the Sixth Circuit, based on his firsthand observations. The Eleventh Circuit viewed that hypothetical as support for its idea that one can distinguish science from experience. *See Carmichael*, 131 F.3d at 1435-36. The beekeeper hypothetical is not instructive, however, because the beekeeper, if called as a witness, would not be testifying as an expert. Rather, he would be relying on his firsthand observations and, as such, would be a mere fact witness, with all the legal restrictions, such as the application of the role against hearsay, that apply to such witnesses.

B. The Myth Of Science Versus Nonscience

A number of circuits have declined to apply *Daubert* to the opinions of engineers on the grounds that *Daubert* only applies to scientific, and not technical, opinions.[14] This so-called "dual level approach," where a science expert is held to a higher standard than a nonscience expert presupposes a commonly accepted definition of "science." A definition that would be useful in a legal context, though, does not exist. Scientists tend to define their discipline in terms of the method used: a discipline is a science, if and only if it makes use of the "scientific method." This sort of operational definition, while useful to the scientific community, is not useful to courts, because it nullifies the very core of *Daubert*. For example, if a witness offers an expert opinion that would be within the normal ken of a scientist, but without regard to the scientific method, then under the "operational definition," the witness is not testifying about science, since the scientific method was not used, and therefore, *Daubert* does not apply.

The "dual level approach" runs into other difficulties. In particular, epidemiology, which was the focal point of *Daubert* itself and which was characterized by this Court as a science, would not qualify as a "science," because epidemiology is not concerned with unearthing natural laws nor with developing, through generalization, grand theories of disease. Rather, the focus of epidemiology is limited to measuring associations between disease endpoints and various exposures in selected populations. In this regard, epidemiology would be no different, and no more of a science, than engineering: engineers use the principles of science while epidemiologists use the methods of science. Similarly, experimental psychology, psycho-

[14] *See Iacobelli Constr., Inc. v. County of Monroe*, 32 F.3d 19, 24-25 (2d Cir. 1994) (holding that geotechnical consultant is not a scientist and not subject to *Daubert*); *McKendall v. Crown Control Corp.*, 122 F.3d 803, 807-08 (9th Cir. 1997) (holding that since a mechanical engineer is not a scientist, *Daubert* does not apply).

linguistics, and economics would all fail to meet the grade as "science."

Thus, while some courts have labored to define science, such an exercise is unnecessary. Rule 702 draws no distinction between science and nonscience. The Rule was not designed to force judges to create artificial classifications, but to assist them in evaluating the reliability and helpfulness of proffered expert evidence.

III. TESTIMONY OF EXPERTS MUST BE EVALUATED WITHIN THE ANALYTICAL FRAMEWORK OF THE EXPERT'S DISCIPLINE

In light of the plain meaning of Rule 702 and its objective to ensure reliable expert testimony, *amici* suggest that trial courts should use the same framework for judging the reliability of technical and other specialized opinions as they use for "scientific" opinions. A unified, yet flexible approach makes common sense because, aside from being true to the language of Rule 702, it frees courts from the need to categorize testimony that may not be readily categorizible. It also provides the legal process with needed symmetry. Common sense requires and Rule 702 demands that expert witnesses adhere to the same professional standards when testifying before a jury as when designing a tire, evaluating a bridge, assessing a specific risk, or diagnosing a disease.

A. An Analytical Framework Is Necessary For Knowledge to Exist

Amici submit that the *Daubert* framework, which has worked well with respect to scientific opinions, will work equally well when applied to engineering and other technical testimony. To the extent that a discipline employs an established analytical framework for amassing information and drawing conclusions, as it must to qualify as "knowledge," a *Daubert*-type analysis is required. Many have argued that *Daubert* cannot be readily applied to

endeavors such as engineering and differential diagnoses, and as such, they argue that those disciplines should be judged against a simpler, more relaxed standard. As noted above, however, Rule 702 does not favor such discriminatory treatment.

Daubert is concerned with the evidentiary reliability of an opinion purportedly based on "knowledge." Knowledge, however, cannot exist in a vaccum. It requires an analytical framework. In *Daubert*, the framework was the scientific method and two of the Court's guidelines were in fact extracted from the scientific method—falsification and peer reviewed publication. *Daubert*, though, is sufficiently flexible to accommodate virtually any technical discipline. This does not mean that each of the Court's guidelines in *Daubert* will necessarily apply in all cases nor does it foreclose the use of other guidelines, as appropriate. The issue central to a *Daubert*-analysis is not "have all the guidelines been met," but rather does the opinion qualify as knowledge within the constraints of the discipline involved. *Daubert* is, therefore, discipline specific: the expert's opinion is judged against the analytical framework pertinent to his or her own discipline.

As a practical matter, determining the analytical standards of a given discipline, and hence the set of appropriate guidelines, is relatively straightforward. After all, if the witness is a true expert he or she should have little difficulty explaining not only how his or her conclusions were reached, but also how they conform to the practices of his or her profession or discipline. Most technical disciplines —from automobile engineering to fire inspection—have published methodological standards and provide clear guidelines that can be used to help assess whether the testimony constitutes "knowledge" with respect to that discipline.[15]

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[15] *See generally* Jonathan M. Hoffman, *'Daubert's' Application to Testimony From Non-Scientific Experts*, Prod. Safety & Liab. Rptr., July 31, 1998, at 739-40 (indicating that many professional organizations, such as the ASTM (formerly the American Society for Testing Materials), The Society of Automotive Engineers (SAE), and the National Fire Protection Association, have established standards within their disciplines).

With respect to engineering, for instance, *amici* suggest that the appropriate starting point is the engineering method. It can, of course, operate at a number of levels. For example, in this case, one can compare the procedures used by Carlson, the Respondents' expert, against those that would have been used by an engineer adhering to the engineering method. As noted above, Carlson's methodology failed to conform to the "engineering method." He was, as a practical matter, a lay witness.

Alternatively, as suggested above, one could examine the principles underlying Carlson's testimony in light of the scientific method. Carlson alleged that certain physical characteristics of a tire, when taken in combination, are associated with underinflation, a form of tire abuse. This assumption-based association, which was fundamental to Carlson's ultimate conclusion, is really no different than the associations discussed by the epidemiologist in *Daubert* or the assumptions of the toxicologist in *Joiner*. In all three cases, the assumptions could have been tested, but were not. Indeed, since Carlson was dealing with an inanimate object, his ability to test was far greater than that of the witnesses in *Daubert* or *Joiner*. Opportunity aside, Carlson performed no testing to verify the validity of his fundamental assumptions. Thus, under even a straightforward *Daubert* analysis, Carlson's conclusory testimony fails to pass the reliability gateways of Rule 702.

Thus, whether one looks to the scientific method or to the engineering method, makes little difference in this case. Carlson's testimony fails to pass muster under *Daubert's* two generic guidelines that apply to all disciplines: (1) whether the error rate of the expert's method or technique is acceptable, and (2) whether the

expert's method or technique is generally accepted by others in the expert's discipline.

It is impossible for a court to assess evidentiary reliability without knowing the accuracy of the expert's technique. Ascertaining the accuracy of the method or technique is not difficult, regardless of whether the discipline is engineering, medicine, accounting, economics, or finance.

In medicine, for instance, virtually all clinical laboratory tests that a physician may order for a patient have published error rates (*i.e.*, likelihood of false positive, likelihood of false negative) associated with them. The tolerance of the technique is the test of its trustworthiness. In this case, the expert could not provide any information with regard to the accuracy (or predictive force) of his methods or techniques. Therefore, it would have been impossible for a factfinder to have concluded that those methods and techniques were reliable, when the expert himself could provide no such assurance.

B. Evaluation of Expert Opinion By A Court Is Not Intrusive, Since It Is Designed To Ensure That The Factfinder Is "Assisted" By The Expert

Some believe that *Daubert* should not be extended to cover engineering testimony, because a *Daubert* review undermines jury decisionmaking and, by inference, improperly intrudes on one's right to civil jury trial. These critics ignore certain basic facts. First, Rule 702 and the *Daubert* guidelines already govern such testimony. Second, Rule 702 and *Daubert* are aimed at ensuring that the jury is "assisted" and not befuddled by the expert testimony.

A jury trial, above all, is a method of dispute resolution and that method should use standards that mirror external reality. *Amici* submit that it would not be in the interest of finding the truth at trial to have professional engineers use validated engineering principles to design

and manufacture a product, and have a court use a totally different set of invalidated conclusions to judge the safety of that product. Products must be judged against rational, validated standards, and not against amorphous, subjective, untestable conclusions.

In sum, *amici* submit that the reliability gateways of Rule 702 of the Federal Rules of Evidence, as articulated by this Court in *Daubert*, apply with equal vigor to both scientific and technical knowledge. If persons testify based on untested experience they are lay witnesses, not experts.

CONCLUSION

For these reasons, *amici curiae*, the American Tort Reform Association, American Consulting Engineers Council, and National Association of Manufacturers submit that Respondents' expert testimony was properly excluded by the District Court. The judgment of the Court of Appeals should be reversed.

Respectfully submitted,

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